APPENDIX A
DEFINITIONS

BEST TRACK - A subjectively smoothed path, versus a precise and very erratic fix-to-fix path, used to represent tropical cyclone movement, and based on an assessment of all available data.

BINARY INTERACTION - Binary interaction is a mutual cyclonic orbit of two tropical cyclones around their centroid. Lander and Holland (1993) showed that the behavior of most binary tropical cyclones consists of an approach, sudden capture, then a period of steady cyclonic orbit followed by a sudden escape or (less frequently) a merger.

CENTER - The vertical axis or core of a tropical cyclone. Usually determined by cloud vorticity patterns, wind and/or pressure distribution.

EPHEMERIS - Position of a body (satellite) in space as a function of time; used for gridding satellite imagery. Since ephemeris gridding is based solely on the predicted position of the satellite, it is susceptible to errors from vehicle wobble, orbital eccentricity, the oblateness of the Earth, and variation in vehicle speed.

EXPLOSIVE DEEPENING - A decrease in the minimum sea-level pressure of a tropical cyclone of 2.5 mb/hr for at least 12 hours or 5 mb/hr for at least six hours (Dunnavan 1981).

EXTRATROPICAL - A term used to indicate that a cyclone has lost its "tropical" characteristics. The term implies both poleward displacement from the tropics and the conversion of the cyclone's primary energy source from the release of latent heat of condensation to baroclinic processes. In the XT technique (Miller and Lander 1997a) a tropical cyclone is defined as having completed extratropical transition when the circulation center has moved poleward of the polar jet maximum or when water vapor imagery clearly indicates the system has become entirely cold-core. It is important to note that cyclones can become extratropical and still maintain winds of typhoon or storm force.

EYE - The central area of a tropical cyclone when it is more than half surrounded by wall cloud.

INTENSITY - The maximum sustained 1-minute mean surface wind speed, typically within one degree of the center of a tropical cyclone.

MAXIMUM SUSTAINED WIND - The highest surface wind speed averaged over a 1-minute period of time. (Peak gusts over water average 20 to 25 percent higher than sustained winds).

MEI-YU FRONT - The Term "mei-yu" is the Chinese expression for "plum rains". The mei-yu front is a persistant east-west zone of disturbed weather during spring which is quasi -stationary and stretches from the east China coast, across Taiwan, and eastward into the Pacific south of Japan.

MONSOON DEPRESSION - A tropical cyclonic vortex characterized by: 1) its large size, the outer-most closed isobar may have a diameter on

the order of 600 nm (1000 km); 2) a loosely organized cluster of deep convective elements; 3) a low-level wind distribution which features a 100-nm (200-km) diameter light-wind core which may be partially surrounded by a band of gales; and, 4) a lack of a distinct cloud system center. Note: most monsoon depressions which form in the western North Pacific eventually acquire persistent central convection and accelerated core winds marking its transition into a conventional tropical cyclone.

MONSOON GYRE - A mode of the summer monsoon circulation of the western North Pacific characterized by: 1) a very large nearly circular low-level cyclonic vortex that has an outer-most closed isobar with diameter on the order of 1200 nm (2500 km); 2) a cloud band rimming the southern through eastern periphery of the vortex/surface low; 3) a relatively long (two week) life span - initially, a subsident regime exists in its core and western and northwestern quadrants with light winds and scattered low cumulus clouds; later, the area within the outer closed isobar may fill with deep convective cloud and become a monsoon depression or tropical cyclone; and, 4) the large vortex cannot be the result of the expanding wind field of a preexisting monsoon depression or tropical cyclone. Note: a series of small or very small tropical cyclones may emerge from the "head" or leading edge of the peripheral cloud band of a monsoon gyre (JTWC 1993; Lander 1994a).

RAPID DEEPENING - A decrease in the minimum sea-level pressure of a tropical cyclone of 1.75 mb/hr or 42 mb for 24-hours (Holliday and Thompson 1979).

RECURVATURE - The turning of a tropical cyclone from an initial path toward the west and poleward to east and poleward, after moving poleward of the mid-tropospheric subtropical ridge axis.

REVERSE-ORIENTED MONSOON TROUGH - The distinguishing characteristics of a reverse-oriented monsoon trough in the western North Pacific are a SW-NE (i.e., reverse) orientation of the trough axis with respect to the normal NW-SE orientation of the trough axis, and the penetration of the trough axis into subtropical areas normally the province of easterly flow.

SIGNIFICANT TROPICAL CYCLONE - A tropical cyclone becomes “significant” with the issuance of the first numbered warning by the responsible warning agency.

SIZE - The areal extent of a tropical cyclone, usually measured radially outward from the center to the outer-most closed isobar. Based on an average radius of the outer-most closed isobar, size categories in degrees of latitude follow: < 2° = very small, 2° to 3° = small, 3° to 6° = medium (average), 6° to 8° = large, and 8° or greater = very large (Brand 1972 and a modification of Merrill 1982).

STRENGTH - The average wind speed of the surrounding low-level wind flow, usually measured within a one to three degree annulus of the center of a tropical cyclone (Weatherford and Gray 1985).

SUBTROPICAL CYCLONE - A low pressure system that forms over the

ocean in the subtropics and has some characteristics of a tropical circulation, but not a central dense overcast. Although of upper cold low or low-level baroclinic origins, the system can transition to a tropical cyclone.

SUPER TYPHOON - A typhoon with maximum sustained 1-minute mean surface winds of 130 kt (67 m/sec) or greater.

TROPICAL CYCLONE - A non-frontal, migratory low-pressure system, usually of synoptic scale, originating over tropical or subtropical waters and having a definite organized circulation.

TROPICAL DEPRESSION - A tropical cyclone with maximum sustained 1-minute mean surface winds of 33 kt (17 m/sec) or less.

TROPICAL DISTURBANCE - A discrete system of apparently organized convection, generally 100 to 300 nm (185 to 555 km) in diameter, originating in the tropics or subtropics, having a non-frontal, migratory character and having maintained its identity for 12- to 24-hours. The system may or may not be associated with a detectable perturbation of the low-level wind or pressure field. It is the basic generic designation which, in successive stages of development, may be classified as a tropical depression, tropical storm, typhoon or super typhoon.

TROPICAL STORM - A tropical cyclone with maximum 1-minute mean sustained surface winds in the range of 34 to 63 kt (18 to 32 m/sec), inclusive.

TROPICAL UPPER-TROPOSPHERIC TROUGH (TUTT) - A dominant climatological system and a daily upper-level synoptic feature of the summer season, over the tropical North Atlantic, North Pacific and South Pacific Oceans (Sadler 1979). Cold core lows in the TUTT are referred to as cells, or TUTT cells.

TYPHOON (HURRICANE) - A tropical cyclone with maximum sustained 1-minute mean surface winds of 64 to 129 kt (33 to 66 m/sec). West of 180° E longitude they are called typhoons and east of 180° E longitude hurricanes.

WALL CLOUD - An organized band of deep cumuliform clouds that immediately surrounds the central area of a tropical cyclone. The wall cloud may entirely enclose or partially surround the center.

WESTERLY WIND BURST - A short-duration low-level westerly wind event along and near the equator in the western Pacific Ocean (and sometimes in the Indian Ocean) (Luther et al. 1983). Typically, a westerly wind burst (WWB) lasts several days and has westerly winds of at least 10 kt (5 m/sec) (Keen 1988). Most WWBs occur during the monsoon transition months of April-May, and November-December. They show some relationship to the ENSO phenomenon (Luther et al. 1983; Ramage 1986). Some WWBs are even more energetic, with wind speeds of 30 kt (15 m/sec) observed during well-developed systems. These intense WWBs are associated with a large cluster of deep-convective cloud along the equator. An intense WWB is a necessary precursor to the formation of tropical cyclone twins symmetrical with respect to the equator (Keen 1982; Lander 1990

APPENDIX B
NAMES FOR TROPICAL CYCLONES IN THE WESTERN NORTH PACIFIC OCEAN AND SOUTH CHINA SEA

Column 1		Column 2		Column 3		Column 4	
ANN	*AN*	**ABEL**	*A-bel*	**AMBER**	*AM-ber*	**ALEX**	*AL-x*
BART	*BART*	**BETH**	*BETH*	**BING**	*BING*	**BABS**	*BABS*
CAM	*KAM*	**CARLO**	*KAR-lo*	**CASS**	*KASS*	**CHIP**	*CHIP*
DAN	*DAN*	**DALE**	*DAY-l*	**DAVID**	*DAY-vid*	**DAWN**	*DAWN*
EVE	*EEV*	**ERNIE**	*ER-nee*	**ELLA**	*EL-la*	**ELVIS**	*EL-vis*
FRANKIE	*FRANK-ee*	**FERN**	*FERN*	**FRITZ**	*FRITZ*	**FAITH**	*FAITH*
GLORIA	*GLOR-ee-uh*	**GREG**	*GREG*	**GINGER**	*JIN-jer*	**GIL**	*GIL*
HERB	*HERB*	**HANNAH**	*HAN-nah*	**HANK**	*HANGK*	**HILDA**	*HIL-dah*
IAN	*EE-an*	**ISA**	*EE-sah*	**IVAN**	*I-van*	**IRIS**	*I-ris*
JOY	*JOY*	**JIMMY**	*JIM-ee*	**JOAN**	*JONE*	**JACOB**	*JAY-kob*
KIRK	*KIRK*	**KELLY**	*KEL-lee*	**KEITH**	*KEETH*	**KATE**	*KATE*
LISA	*LEE-sah*	**LEVI**	*LEEV-eye*	**LINDA**	*LIN-dah*	**LEO**	*LEE-o*
MARTY	*MAR-tee*	**MARIE**	*mah-REE*	**MORT**	*MORT*	**MAGGIE**	*MAG-gee*
NIKI	*NI-kee*	**NESTOR**	*NES-tor*	**NICHOLE**	*nik-KOL*	**NEIL**	*NEEL*
ORSON	*OR-son*	**OPAL**	*O-pel*	**OTTO**	*OT-tow*	**OLGA**	*OL-gah*
PIPER	*PI-per*	**PETER**	*PEE-ter*	**PENNY**	*PEN-nee*	**PAUL**	*PAUL*
RICK	*RICK*	**ROSIE**	*RO-zee*	**REX**	*REX*	**RACHEL**	*RAY-chel*
SALLY	*SAL-lee*	**SCOTT**	*SKOT*	**STELLA**	*STEL-lah*	**SAM**	*SAM*
TOM	*TOM*	**TINA**	*TEE-nah*	**TODD**	*TOD*	**TANYA**	*TAHN-yah*
VIOLET	*VI-uh-let*	**VICTOR**	*vik-TOR*	**VICKI**	*VIK-kee*	**VIRGIL**	*VER-jil*
WILLIE	*WIL-lee*	**WINNIE**	*WIN-nee*	**WALDO**	*WAL-do*	**WENDY**	*WEN-dee*
YATES	*YATES*	**YULE**	*YOU-l*	**YANNI**	*YAN-ni*	**YORK**	*YORK*
ZANE	*ZANE*	**ZITA**	*ZEE-tah*	**ZEB**	*ZEB*	**ZIA**	*ZEE-uh*

NOTE 1: Assign names in rotation, alphabetically, starting with (ANN) for first tropical cyclone of 1996. When the last name in Column 4 (ZIA) has been used, the sequence will begin again with the first name in Column 1 (ANN).

NOTE 2: Pronunciation guide for names is italicized.

SOURCE: CINCPACINST 3140.1W

APPENDIX C
CONTRACTIONS

AB Air Base

ABW Air Base Wing

ABIO Significant Tropical Weather Advisory for the Indian Ocean

ABPW Significant Tropical Weather Advisory for the Western Pacific Ocean

ACCS Air Control Center Squadron

ACFT Aircraft

ADEOS Japanese Advanced Earth Observing Satellite

ADP Automated Data Processing

AFB Air Force Base

AFDIS Air Force Dial-In System

AFWA Air Force Weather Agency

AIREP Aircraft (Weather) Report

AJTWC Alternate Joint Typhoon Warning Center

AMOS Automatic Meteorological Observing Station

AOR Area of Responsibility

ARC Automated Remote Collection (system)

ARGOS (International Service for Drifting Buoys)

ARQ Automated Response to Query

ATCF Automated Tropical Cyclone Forecast (system)

ATCR Annual Tropical Cyclone Report

AUTODIN Automated Digital Network

AVHRR Advanced Very High Resolution Radiometer

AWDS Automated Weather Distribution System

AWN Automated Weather Network

BLND Blended (Hybrid Aid)

BRAC Base Realignment and Closure

CDO Central Dense Overcast

CI Current Intensity

CIMSS Cooperative Institute for Meterological Satellite Studies

CIV Civilian

CLD Cloud

CLIM Climatology

CLIP or **CLIPER** Climatology and Persistence Technique

CM Centimeter(s)

C-MAN Coastal-Marine Automated Network

CMOD Compact meteorological and Oceanographic Drifter (buoy)

COMNAVMETOCCOM or **CNMOC** Commander Naval Meteorology and Oceanography Command

CPA Closest Point of Approach

CPHC Central Pacific Hurricane Center

CSC Cloud System Center

CSUM Colorado State University Model

CW Continuous Wave

DAVE Name of a Hybrid Aid

DD Digital Dvorak

DDN Defense Data Network

DEG Degree(s)

DFS Digital Facsimile System

DISN Defense Information Systems Network

DMS Defense Messaging System

DMSP Defense Meteorological Satellite Program

DOD Department of Defense

DSN Defense Switched Network

DTG Date Time Group

EGRR Bracknell Model

ENSO El Niño-Southern Oscillation

ERS European Remote Sensing Satellite

FBAM FNOC Beta and Advection Model

FI Forecast Intensity (Dvorak)

FLENUMETOCCEN Fleet Numerical Meteorology and Oceanography Center

FT Foot/Feet

FTP File Transfer Protocol

GFDN Geophysical Fluid Dynamics-Navy Model

GCA Great Circle Arc

GFDN Geophysical Fluid Dynamics - Navy

GMS Japan Geostationary Meteorological Satellite

GMT Greenwich Mean Time

GOES Geostationary Operational Environmental Satellite

GSRS Geostationary Satellite Receiving System

GTS Global Telecommunications System

HIRS High Resolution Infrared Sounder

hPa Hectopascal

HPAC Mean of XTRP and CLIM Techniques (Half Persistence and Climatology)

HF High Frequency

HR Hour(s)

HRPT High Resolution Picture Transmission

ICAO International Civil Aviation Organization

INIT Initial

INST Instruction

IP Internet Protocol

IR Infrared

JGSM Japanese Global Spectral model

JTWC Joint Typhoon Warning Center

JTWC92 Statistical-Dynamical or JT92 Objective Technique

JTYM Japanese Typhoon Model

KM Kilometer(s)

KT Knot(s)

LAN Local Area Network

LAT Latitude

LLCC Low-Level Circulation Center

LONG Longitude

LUT Local User Terminal

LVL Level

M Meter(s)

MAX Maximum

MB Millibar(s)

MBAM Medium Beta and Advection Model

MCAS Marine Corps Air Station

MCS Mesoscale Convective System

MET Meteorological

METEOSAT European Meteorological Satellite

MIDDAS Meteorological Imagery, Data Display, and Analysis System

MIN Minimum

MINI-MET Mini-Meteorological (buoy)

MISTIC Mission Sensor Tactical Imaging Computer

MM Millimeter(s)

MOVG Moving

MSLP Minimum Sea-level Pressure

MSU Microwave Sounding Unit

NARDAC Naval Regional Data Automation Center

NAS Naval Air Station

NASA National Aeronautics and Space Administration

NAVPACMETOCCEN Naval Pacific Meteorology and Oceanography Center (Hawaii)

NAVPACMETOCCEN WEST Naval Pacific Meteorology and Oceanography Center West (Guam)

NCEP National Centers for Environmental Prediction

NEDN Naval Environmental Data Network

NESDIS National Environmental Satellite, Data, and Information Service

NESN Naval Environmental Satellite Network

NEXRAD Next Generation (Doppler Weather) Radar (WSR-88D)

NGDC National Geophysical Data Center

NHC National Hurricane Center

NIPRNET Non-secure Internet Protocol Router Network

NM Nautical Mile(s)

NMC National Meteorological Center

NOAA National Oceanic and Atmospheric Administration

NODDES Naval Environmental Data Network Oceanographic Data Distribution and Expansion System

NOGAPS Navy Operational or **NGPS** Global Atmospheric Prediction System

NODDS Naval Oceanography Data Distribution Systems

NPS Naval Postgraduate School

NR Number

NRL Naval Research Laboratory

NRL-MRY Naval Research Laboratory at Monterey, CA

NRPS or Navy Operational

NORAPS Regional Atmospheric Prediction System

NSCAT NASA Scatterometer

NSDS-G Naval Satellite Display System - Geostationary

NTWP Naval Telecommunications Area Master Station, Western Pacific

SIPRNET Secret Internet Protocol Router Network

NWP Northwest Pacific

NWS National Weather Service

OBS Observations

OLS Operational Linescan System

ONR Office of Naval Research

OSS Operations Support Squadron

OSB Ocean Sciences Branch

OTCM One-Way (Interactive) Tropical Cyclone Model

PACAF Pacific Air Force

PACMEDS Pacific Meteorological Data System

PACOM Pacific Command

PAGASA Philippine Atmospheric Geophysical, and Astronomical Services Administation

PC Personal Computer

PCN Position Code Number

PDN Public Data Network

PIREP Pilot Weather Report(s)

QBO Quasi-Biennial Oscillation

RADOB Radar Observation

RECON Reconnaissance

RECR Recurve (Forecast Aid)

RMSE Root mean square error

ROCI Radius of outer-most closed isobar

SAT Satellite

SCS South China Sea

SDHS Satellite Data Handling System

SEC Second(s)

SFC Surface

SGDB Satellite Global Data Base

SIPRNET Secret Internet Protocol Router Network

SLP Sea-Level Pressure

SPAWRSYSCOM Space and Naval Warfare Systems Command

SPIDR Space Physics Interactive Data Resource

SSM/I Special Sensor Microwave/Imager

SST Sea Surface Temperature

SSU Stratosphere Sounding Unit

ST Subtropical

STNRY Stationary

STR Subtropical Ridge

STRT Straight (Forecast Aid)

STY Super Typhoon

SWDIS Satellite Weather Data Imaging System

TAPT Typhoon Acceleration Prediction Technique

TC Tropical Cyclone

TCFA Tropical Cyclone Formation Alert

TD Tropical Depression

TDA Typhoon Duty Assistant

TDO Typhoon Duty Officer

TELEFAX Telephone Facsimile

TESS Tactical Environmental Support System

TIFF Tagged Image File Format

TIROS-N Television Infrared Observational Satellite-Next Generation

TOGA Tropical Ocean Global Atmosphere

TOVS TIROS Operational Vertical Sounder

TS Tropical Storm

TUTT Tropical Upper-Tropospheric Trough

TY Typhoon

TYAN Typhoon Analog (Forecast Aid)

ULCC Upper-Level Circulation Center

US United States

USAF United States Air Force

USCINCPAC Commander-in-Chief Pacific (AF - Air Force, FLT - Fleet)

USN United States Navy

VIS Visual

WAN Wide Area Network

WESTPAC Western (North) Pacific

WGTD Weighted (Hybrid Aid)

WMO World Meteorological Organization

WNP Western North Pacific

WRN or **WRNG** Warning(s)

WSD Wind Speed and Direction

WSR-88D Weather Surveillance Radar - 1988 Doppler

WVTW Water Vapor Tracked Winds

WWB Westerly Wind Burst

WWW World Wide Web

XT Extratropical

XTRP Extrapolation

Z Zulu time (Greenwich Mean Time/Universal Coordinated Time)

APPENDIX D

PAST ANNUAL TROPICAL CYCLONE REPORTS

Copies of the past Annual Tropical Cyclone Reports for DOD agencies or contractors can be obtained through:

Defense Technical Information Center (DTIC)
DTIC-BR (Reference & Retrieval Division)
8725 John J. Kingman Road
Suite 0940
Ft. Belvoir, VA 22060-6218

Phone: comm (703) 767-8274
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Fax: comm (703) 767-9070
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1961	AD 786149	1974	AD 010271	1987	AD A191883
1962	AD 786128	1975	AD A023601	1988	AD A207206
1963	AD 786208	1976	AD A038484	1989	AD A232469
1964	AD 786209	1977	AD A055512	1990	AD A239910
1965	AD 786210	1978	AD A070904	1991	AD A251952
1966	AD 785891	1979	AD A082071	1992	AD A274464
1967	AD 785344	1980	AD A094668	1993	AD A285097
1968	AD 785251	1981	AD A112002	1994	AD A301618
1969	AD 785178	1982	AD A124860	1995	AD A321611
1970	AD 785252	1983	AD A137836	1996	AD A332916
1971	AD 768333	1984	AD A153395		